

WHAT IS CLAIMED IS:

1. An article suitable for sintering by heat into a rigid annular valve structure having exterior and interior peripheries, the rigid annular valve structure providing a multiplicity of annularly and axially spaced generally radially extending device passageways which extend between the exterior and interior peripheries, the article comprising:

a series of individual green state discs fabricated from a powder mixture in an unsintered green state, each one of the individual green state discs having opposing faces and a thickness between the faces, with certain ones of the individual green state discs defining disc passages formed between the opposing faces thereof;

the series of green state discs being mounted in a stack with the opposing faces being disposed in abutting contact in a manner such that the disc passages collectively define a plurality of substantially right angle turns of the generally radially extending device passageways.

2. The article of Claim 1 wherein:

the disc passages of respective ones of the green state discs extend completely therethrough in a radial direction but only partially through in an axial direction;

each of the green state discs is substantially identically configured; and

the series of green state discs are angularly aligned such that the respective ones of the disc passages of adjacent ones of the green state discs collectively define the plurality of substantially right angle turns which are oriented in a plane generally parallel to the opposing faces.

3. The article of Claim 2 wherein the configuration of the green state discs is variable along the stack.

4. The article of Claim 2 wherein:

the disc passages of respective ones of the green state discs define a first and second radially-aligned series of holes extending completely therethrough in the axial direction but only partially through in the radial direction, the first series of holes being angularly offset from the second series of holes in each one of the green state discs; and

the series of green state discs are angularly aligned such that the first series of holes in one of the green state discs is superimposed upon and interconnected with the second series of holes of an adjacent one of the green state discs to collectively define the plurality of substantially right angle turns which are oriented in a plane generally perpendicular to the opposing faces.

5. The article of Claim 1 wherein the series of individual green state discs are fabricated from a stainless steel powder mixture in an unsintered green state.

6. The article of Claim 1 wherein the series of individual green state discs are fabricated from a tungsten carbide powder mixture in an unsintered green state.

7. The article of Claim 1 wherein the series of individual green state discs are fabricated from a cobalt alloy powder mixture in an unsintered green state.

8. The article of Claim 1 wherein the series of individual green state discs are fabricated from a ceramic powder mixture in an unsintered green state.

9. The method of Claim 1 wherein the series of green state discs are fabricated from a tool steel powder mixture in an unsintered green state.

10. The method of Claim 1 wherein the series of green state discs are fabricated from a superalloy powder mixture in an unsintered green state.

11. A rigid annular valve structure fabricated from an article as defined in Claim 1 comprising:

a sintered rigid body formed by sintering the stack of individual green state discs under heat, the radially extending device passageways of the article defining radially outer and inner ends thereof, with the exterior and interior peripheries of the article being configured to fluidly communicate with respective ones of the outer and inner ends.

12. A valve assembly including the rigid annular valve structure as defined in Claim 11 comprising:

a valve housing having the rigid annular valve structure mounted therein such that fluid flowing through the valve housing passes through the device passageways; and

a valve plug slidably disposed within the interior periphery, the valve plug being configured to regulate the number of device passageways through which fluid may pass.

13. The valve assembly of Claim 12 wherein the interior periphery and the valve plug are each cylindrically shaped.

14. A method of forming a rigid annular valve structure having a series of annularly and axially-spaced generally radially-extending device passageways fluidly communicating between exterior and interior peripheries of the rigid annular valve structure, the device passageways having radially inner and outer ends, the method comprising:

providing a series of individual green state discs fabricated from a powder mixture in an unsintered green state;

forming each one of the green state discs with opposing faces and a thickness;

forming certain ones of the green state discs with disc passages between the opposing faces thereof;

mounting the series of green state discs in an axially aligned stack with the opposing faces of adjacent ones of the green state discs being disposed in abutting contact such that the disc passages collectively define the device passageways;

applying heat to the series of green state discs to form a sintered rigid body; and

machining the sintered rigid body to form the exterior periphery fluidly communicating with the outer ends of the device passageways and the interior periphery fluidly communicating with the inner ends of the device passageways.

15. The method of Claim 14 wherein the series of green state discs are fabricated from stainless steel powder mixture in an unsintered green state.

16. The method of Claim 14 wherein the series of green state discs are fabricated from tungsten carbide powder mixture in an unsintered green state.

17. The method of Claim 14 wherein the series of green state discs are fabricated from cobalt alloy powder mixture in an unsintered green state.

18. The method of Claim 14 wherein the series of green state discs are fabricated from ceramic powder mixture in an unsintered green state.

19. The method of Claim 14 wherein the series of green state discs are fabricated from a tool steel powder mixture in an unsintered green state.
20. The method of Claim 14 wherein the series of green state discs are fabricated from a superalloy powder mixture in an unsintered green state.
21. The method of Claim 14 wherein the exterior and interior peripheries are machined into a cylindrical shape.
22. The method of Claim 14 further comprising the step of machining the sintered rigid body to form substantially planar ends thereon.
23. The method of Claim 14 wherein the disc passages and the opposing faces of respective ones of the green state discs are formed by injection molding.
24. The method of Claim 14 wherein the disc passages are machined by wire electrical discharge machining.
25. The method of Claim 14 wherein the disc passages are machined by water jet machining.